

MISCELLANEOUS.

Note on the Dates of "The Zoology of the 'Beagle.'"

GENTLEMEN,—By the courtesy of Messrs. Smith, Elder, and Co., I was enabled, in August 1895, to ascertain the contents and dates of the separate parts of "The Zoology of the 'Beagle.'" I append the data for the convenience of other workers; and as the items in column 4 of Messrs. Smith, Elder, & Co.'s report include titlepages, fly-sheets, &c., I have added in square brackets the actual text pagination for greater clearness.

Parts.	Contents.	Plates.	Pages.	Date.
1	Foss. Mamm.	7	46 [1-40]	Feb. 1838.
2	Mamm.	10	16 [1-16]	May "
3	Aves.	10	16 [1-16]	July "
4	Mamm.	8	24 [17-32]	Sept. "
5	Mamm.	8	16 [33-48]	Nov. "
6	Aves.	10	16 [17-32]	Jan. 1839.
7	Foss. Mamm.	10	32 [41-68]	Mar. "
8	Foss. Mamm.	10	16 [69-80]	May "
9	Aves.	10	24 [33-56]	July "
10	Mamm.	9	60 [49-100]	Sept. "
11	Aves.	10	40 [57-96]	Nov. "
12	Pisces.	8	32 [1-32]	Jan. 1840.
13	Foss. Mamm.	5	36 [81-112]	Apr. "
14	Pisces.	7	32 [33-64]	June "
15	Aves.	10	76 [97-164]	Mar. 1841.
16	Pisces.	5	32 [65-96]	Apr. "
17	Pisces.	9	92 [97-172]	Apr. 1842.
18	Rept.	10	16 [1-16]	Aug. "
19	Rept.	10	44 [17-52]	Oct. 1843.

C. DAVIES SHERBORN
(*'Index animalium'*).

White Ants; with some Account of their Habits and Depredations.

By WALTER W. FROGGATT, New South Wales Government Entomologist.

Specimens of potatoes were received from Mr. Broughton Corrie, Colo Vale, about the middle of February, with the information that when harvesting his crop he had found those in one corner of the field covered with white ants, which were burrowing into and gnawing the centres out of otherwise perfectly sound tubers; but as none of the insects were sent with this consignment, further information was asked for.

In response to my request, further samples of potatoes were sent down swarming with live soldiers and workers of these destructive little creatures, and so honeycombed with their attacks that only

the outer surfaces were solid. Shortly afterwards I paid a visit to Mr. Corrie's farm, and made the following observations:—

The bulk of the potatoes had been harvested, but a few remained undisturbed in the corner infested, and every one we turned over was more or less riddled with ant-holes. The field in which the crop had been planted was new land, only cleared the previous season, and still containing a number of the larger stumps, while about 30 yards from the corner of the paddock there was a large white ants' nest (termitarium), which, partly covering a large stump, reached to about 5 feet in height, and when cut down was found to be swarming with termites in all stages of development. There is not the least doubt that it was foraging parties from this nest that had invaded the paddock.

This termite upon examination proved to be our commonest Sydney species, which is responsible for nearly all the damage done to houses in the city and suburbs. It belongs to the typical genus *Termes*, and in a concluding paper in my "Monograph of the Australian Termitidæ," being published in the 'Proceedings of the Linnean Society of New South Wales,' I propose to call it the "Milk Termite" (*Termes lactis*, sp. n.), on account of the soldiers ejecting a globule of milk-like fluid when disturbed. It was this species that destroyed the roof of the Australian Museum last year, and two years before eat out the floor of the records office in the buildings of the Department of Education in Bridge Street. The same termites are to be found destroying the woodwork of the hot-houses in the Botanic Gardens; and in nearly every instance where the white ants have been sent in from buildings about Sydney they have proved to belong to this species.

In the immediate vicinity of Sydney these termites do not build mound-nests, but are found under logs or stones, gnawing the bark off dead trees, or in small communities about the trunks of trees; but upon the Blue Mountains and all over the Shoalhaven district they build large regular mound-nests.

These termitariums measure from 2 to sometimes $6\frac{1}{2}$ feet in height, broadest at the base, and tapering slightly to a rounded summit. The outer surface consists of a solid earthen wall, often from a foot to 18 inches in thickness, formed of particles of earth gathered upon the surrounding surface and cemented together with the excreta of the workers voided while placing the earth in position. This wall encloses a compact woody mass, slightly separated from it on the sides, but almost touching at the apex. This central portion varies in different parts of the nest in its structure, but chiefly consists of titrated wood that has been eaten and passed through the bodies of the termites, and has a regular foliated structure. these lumps forming a coarse irregular honeycomb. The cap is composed of rounded irregular lumps, but towards the centre, about 6 inches from the ground-level, there is a soft papery-like mass about the size of a man's head, composed of fine sheets folding round each other and full of holes and irregular galleries: this is the nursery, where all the very small larvæ live after they have

hatched out. The eggs, which look like grains of sugar, will be found piled up on the edge of a terraced formation where it joins the nursery. Here the queen's cell is situated, somewhat about the shape and size of an inverted saucer, and surrounded by other terraced cells. Where the base of the nest comes in contact with the ground it forms a coarse network of cells with galleries leading downward into the earth, from which they gain access to the outside world.

All these mounds are in the first instance formed over a dead stump or fallen log, which in the course of time is by the action of the termites transformed into this triturerated woody material. The social life and transformations of the different forms found in these nests is very remarkable, and has puzzled naturalists from earliest ages. Pliny, in his 'Natural History of the World,' where all the curious and remarkable "facts" known to the ancients are recorded, gives the following account of the "Indian Pismires," which is probably intended for white ants:—

"In the country of the Northern Indians, named Dardae, the ants do cast up gold above the ground from out of holes and mines within the earth; these are in colour like to cats, and as big as the wolves of Egypt. This gold before said, which they work up in the winter time, the Indians do steal from them in the extrem heat of summer, waiting their opportunity when the pismires lie close within their caves under the ground from the parching sun, yet not without great danger. For if they happen to wind them, and catch their scent, out they go, and follow after them in great haste, and with such fury they fly upon them, that oftentimes they tear them in pieces, let them make way as fast as they can upon their most swift camels, yet they are not able to save them, so fleet of pace, so fierce of courage are they, to recover the gold they love so well."

Each nest contains three very distinct classes or castes. First, the winged males and females, which hardly differ in general appearance from each other, and are popularly known as "flying ants." They are developed from the eggs by a gradual series of moults, and when about half-grown show well-formed wing-cases. The nests during the winter months are full of these termites in all stages of growth, and early in November they undergo their final moult and emerge with two pairs of full-grown wings. The workers now cut regular galleries through the earthen walls, which are guarded by the soldiers until the time comes for them to all fly from the nest. The bulk of them are destroyed by birds and hundreds of other insects that prey upon these helpless creatures, while thousands of them perish around lamps and fires. A few pairs, however, manage, after shaking off their wings (which have a curious cross suture close to the shoulders by which they are very easily pulled off), to crawl under a log, where, if they manage to exist until they are found by a foraging party of workers and soldiers, they found a fresh colony.

What becomes of the male termite after the female becomes pregnant I do not know, as I have never been able to find him in a

well-developed nest; but the female, which is popularly known as the "queen white ant," as soon as she is settled in her cell, often called the "royal chamber," begins to lay eggs, and while the head and thorax remain at the normal size, her abdomen swells out into a cylindrical rounded white mass as thick as a small pea-pod, which renders her quite helpless and incapable of crawling about. The body now consists of a great number of egg-tubes or ovaries, leading into the egg-laying duct, and from this single insect flows the whole life and reproductive power of the colony. The queen is carefully fed and looked after by the workers, who remove the eggs into adjoining galleries between her cell and the true nursery previously described. The queen may lay eggs for some years, but I do not think either at the rapid rate or for so long as many of our popular writers have asserted, for the workers have the power (probably in the method of feeding the young larvæ) of producing supplementary queens, which never pass through the winged form, but are produced direct from the egg, and probably supersede the queen in cases of emergency, when she has outlived her usefulness or been accidentally destroyed.

The workers, which constitute the bulk of the members of every nest, are aborted females and males (and not only females, as among the bees), whose duties are to do all the building and repairing of the nests, look after the queen, eggs, and larvæ, and all other work in the community; and it is to the powerful jaws of this form that we are indebted for their destructive habits. They measure about 2 lines in length, of a uniform dull white colour, with large rounded heads sometimes tinted with pale yellow; the antennæ formed of a number of rounded bead-shaped segments and a rounded upper lip which covers the short powerful jaws; the thorax is comparatively small; the legs short and stout, armed with fine spines at the base of the shanks; and the abdomen large and rounded.

The soldiers are also aborted males and females, and are never as numerous as the workers. Their duties are to protect the nest and drive off any enemies that appear when it is damaged or broken into, and direct the labours of the workers when adding to or mending gaps in the outer surface of the nest.

They are more slender in form than the workers, with the head pear-shaped and the jaws produced into two stout scissor-like jaws, while above them in the centre of the head is a small cylindrical opening connected with a chamber at the base of the head, through which they can eject the white fluid previously mentioned, which is also a weapon of defence against their enemies.

In these remarkable households it is the blind leading the blind, for neither the soldiers or workers are furnished with eyes, and all their movements must be directed by their delicate sense of touch, for when mending a gap in the nest the soldiers always form themselves into a regular row, standing just far enough apart for them to touch the tip of each other's antennæ, which are constantly

moving, while each worker comes between the soldiers and deposits its load, returning until the breach is closed.

Besides the above-described forms, there are always a great number of immature termites all over the nest, from the tiny larvæ just hatched from the eggs to the pupæ with their wing-cases reaching down to the middle of the back.—*Agricultural Gazette of New South Wales*, May 1897, pp. 297-300.

Care of the Brood in Psolus antarcticus.

By Prof. HUBERT LUDWIG, of Bonn.

I am already once more able to report a hitherto unknown case of care of the brood in Holothurians, and again it is a question of an antarctic species and of a form of care of the brood which is new for Holothurians. Although since its first description by Philippi (1857) *Psolus antarcticus* has been on several occasions the subject of observation and study, for it has been investigated by Studer (1876), Théel (1886), Lampert (1889), and myself (1886), nothing whatever had been learnt of the existence of care of the brood in this species. It is true that we have been told by Wyville Thomson (1876) that another antarctic *Psolus*, Thomson's *P. ephippifer*, brings up its young beneath the dorsal plates modified for this purpose; but that the longest-known antarctic species of *Psolus*—*P. antarcticus* (Phil.)—the range of which extends from Payta (Peru) southwards as far as Cape Horn, also belongs to the forms which care for their brood is an unexpected discovery. The score of large and small specimens that Dr. Michaelsen has brought home from the Hamburg-Magellan Collecting Expedition* include ten small and medium-sized examples which were collected on July 9, 1893, in Smyth Channel (north-east of the Straits of Magellan); among these I met with two which to my surprise carried their young on the ventral side, which is flattened to form the creeping sole.

In the specimen which is the better preserved of the two and measures 12·5 millim. in length by 8·5 millim. in breadth I find almost one half of the creeping sole occupied by young animals (twenty-two in number), which are all in the same stage of development and are attached by their pedicels to the area of the sole which is bare or devoid of pedicels. The pedicels of the adult animal are not touched by the young; moreover, no young are to be found on the outside of the maternal pedicel-zone. While care of the brood is in progress the mother can move about as freely as ever or can attach itself and adhere firmly to its support. Contrary, therefore, to what

* It was in the material obtained by this expedition that I also discovered care of the brood in the case of *Chiridota contorta*, as recently reported by me ('Zool. Anzeiger,' Bd. xx. 1897, no. 534, pp. 217-219 [Ann. & Mag. Nat. Hist. ser. 6, vol. xx. 1897, pp. 327-328]).